1078641

PATENT SPECIFICATION

DRAWINGS ATTACHED

Inventor: FRANK SIDNEY BRYANT

1,078,641

Date of filing Complete Specification: March 5, 1964.

Application Date March 6, 1963. *No. 9006/63.*

Complete Specification Published Aug. 9, 1967.

Index at acceptance: —F2 S6E2

Int. Cl.: —F 16 f

COMPLETE SPECIFICATION

Flexible Joints

We, SILENTBLOC LIMITED, a Company registered under the Laws of Great Britain, of Manor Royal, Crawley, Sussex, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement: —

This invention relates to flexible joints or bearings of the kind comprising an inner member having a substantially cylindrical outer surface, and for example comprising a cylindrical sleeve, and an annulus of rubber or like resilient material surrounding the inner member and adhering to it usually by virtue of radial stretching, bonding or cementing.

In certain applications an outer member is used which surrounds the annulus of rubber, the outer member being received in an outer part and serving to connect that part to another part to which the inner member is connected.

Such joints have been employed for many years for a great number of purposes. In particular they have been employed in the eyes of semi-eliptic springs on cars wherein the annulus of rubber is relatively thin in a radial dimension. It has been found, however, that the thinness of this material is to some extent the cause of noise being transmitted from the road wheels via the springs to the body and so producing drumming or booming in the vehicle itself. It has been proposed to overcome this problem by utilising what may be termed as "flat bushes" for the front eyes of rear springs. For example the outside diameter of the bushes may be of the order of 2" as compared with a thin bush of say 1" external diameter and having a bore of 7/16". It has been found in practice that these larger diameter bushes tend to fret torsionally and to move sideways in the spring eyes owing to the difficulty of maintaining an efficient interference between the external surface of the joint and such a large eye. These large eyes are usually produced by rolling over comparatively thin material with the result that the eyes tend to open and also it is found that the inside diameter of the eye, when relatively large, tends to vary over its axial length. Thus the internal diameter tends to be greater at its ends than in an intermediate region with the result that a joint within the eye tends to be held by a substantial pressure only in a central region. The result of this is that when a torsional slip is taking place because of a relatively high torque being applied through the bush, only a very small axial force is required to move the whole joint within the eye.

If no outer member is used and the rubber annulus is received directly in the spring eye the tendency referred to above is to some extent overcome, but because of the use of a fat bush the radial pressure or stress, due to compression of the bush, at its circumference, i.e., at the eye surface, tends to be relatively low compared with radial pressure or stress existing adjacent the inner member. Hence there is again a tendency for the rubber to creep in the spring eye.

Therefore one of the principal objects of the present invention is to provide arrangements which are particularly suitable for overcoming or alleviating this problem with a relatively large fat bush, although the invention is not limited to any specific size of bush.

According to the present invention a flexible joint for location within the bore of a housing comprises a rigid inner member having a substantially cylindrical external surface, an annular member (hereinafter referred

[*Pr*]

to as the annulus) surrounding the inner member, the annulus being formed of rubber or like resilient material, which material adheres directly to the inner member without the interposition of another member to accommodate torsional loads and, surrounding the annulus, an outer member which confines the annulus to a generally fixed shape, the outer surface of the outer member being irregular to provide spaced axially and circumferentially interconnected contact areas capable of frictionally engaging and conforming to the shape of the bore of the housing by changes in contour of the outer surface of the outer member.

It is to be understood that the term "annulus of rubber or like material" as used in the preceding paragraph and in the claims includes not merely a single sleeve of material but a number of concentric sleeves together forming the annulus.

For example the external surface of the outer member may be made irregular by the provision of indentations or apertures extending through the outer member in a generally radial direction. For example the outer member may be formed of wire mesh or gauze, expanded metal, or woven metal mesh of which the weft and warp conveniently extend oblique to the axis of the joint.

The annulus of rubber preferably extends into or projects through the irregularities in the external surface. Other suitable materials for the outer member include punched sheet metal and certain plastic materials which may be perforated or have areas of varying thickness to permit the taking up of irregularities in the surface of the outer part.

The invention may be carried into practice in a number of ways but several specific embodiments will now be described with reference to the accompanying drawings, in which:—

Figures 1 to 5 are side elevations, partly in section, of various flexible joints according to the present invention.

All the embodiments shown in the drawings comprise flexible joints which are suitable for use in the spring eyes of car suspension systems. The basic form of the joint is standard in that it provides an inner metal sleeve 10 through which passes a spring shackle pin 11 when the joint is in use. Surrounding the inner sleeve 10 is an annulus of rubber 12, in these particular embodiments of slightly shorter length at its outer periphery than at its bore, but if desired the annulus may comprise a cylinder of a length substantially equal to the length of the inner metal sleeve 10.

Surrounding or embedded in the outer periphery of the annulus of rubber 12 of Figure 1 is a sleeve 13 which is formed of expanded metal, i.e. metal which has been punched or otherwise cut with short parallel slits, and thereafter drawn apart to leave apertures 14 separated by slightly twisted metal portions 15.

In the embodiment shown the annulus of rubber is moulded or bonded into the expanded metal sleeve in which case the expanded metal sleeve would of course be virtually embedded in the outer periphery of the rubber annulus. In practice it is found that after the moulding operation the surface of the joint is not smooth since the rubber in the apertures 14 tends to shrink slightly and form slight surface depressions.

Alternatively however, the rubber annulus may be compressed within the expanded metal sleeve so that the compression of the rubber forces the rubber through the apertures 14 in the expanded metal to form rubber pimples. Where necessary suitable cements may be used to aid in securing the expanded metal sleeve to the rubber annulus.

Conveniently the expanded metal sleeve is formed by taking a suitably sized rectangular piece of expanded metal and rolling into a sleeve and welding or otherwise securing the abutting edges. In the particular embodiment shown in Figure 1 the directions of the major axes of the diamond shapes of the apertures 14 extend parallel to the axis of the joint, but this is not essential and can be varied to suit requirements.

Whilst, as has been mentioned, the arrangement in Figure 1 has the annulus of rubber moulded, bonded or compressed within the expanded metal sleeve, as an alternative the expanded metal sleeve can be formed merely by wrapping around the rubber annulus with or without joining the wrapped edges to form a continuous sleeve.

Joints of this kind can be utilized with advantage on the front eyes of rear semi-eliptic springs in a car suspension. Thus as diagrammatically shown in Figure 1 the joint is shown mounted within a spring eye 18. Any slight irregularities in the diameter of the bore 19 of the eye 18 are taken up by the expanded metal of the joint. In practice the joint can be made an interference fit in the eye 18, the eye 18 having an internal diameter slightly less than the overall diameter of the joint itself, so that the expanded metal tends to be compressed slightly, but where regions of the bore of the eye are slightly greater than any other regions this compression of the expanded metal will be slightly less. Nevertheless the pimples 16 of rubber which lie in the apertures 14 will be forced out and will adhere to the bore 19 of the eye 18 and the distribution of the load from the eye to the joint is fairly uniformly obtained over the length of the joint, so that the joint does not tend to creep axially in the eye despite the irregularities referred to. Thus in practice the bore

19 is contacted both by spaced portions of the expanded metal sleeve and also by the rubber between these portions.

It is envisaged that a variety of materials may be employed to form the sleeve surrounding the annulus of rubber depending upon circumstances and depending upon the characteristics required of the completed joint.

For example Figure 2 illustrates a similar arrangement in which the sleeve is formed from wire mesh.

Figure 3 shows an arrangement in which the sleeve is formed from gauze and it will be appreciated that in both the arrangements of Figures 2 and 3 the annulus of rubber can again form pimples within the apertures in the mesh or gauze.

In the arrangement of Figure 4 a close woven metal mesh is employed the weft and warp of the weave extending diagonally with respect to the axis of the joint.

Moreover it is envisaged that the sleeve may be formed when desired from plastic mouldings or plastic sheet materials wrapped into sleeves, for example with apertures through which rubber pimples can be formed as referred to in the previous embodiments. Alternatively as shown in Figure 5 the plastic material need not be perforated but can have an irregular inner and/or outer surface to provide both a key for the rubber annulus on the internal bore of the sleeve and a key between the outer surface of the sleeve of the bore of the eye within which it is received.

Moreover, where desired, the rubber annulus for fat bushes of the type referred to earlier can be formed with rubbers of different grades at different radial distances either as an integral arrangement or by an arrangement of concentric sleeves of rubber. Such an arrangement may include a method of assembly wherein a rubber sleeve having on it an outer member for example of expanded metal can first be inserted into a spring eye if necessary using conventional cements or lubricants whereafter a separate inner sleeve of harder rubber which has already been stretched onto an inner metal sleeve, is forced into the softer rubber. Alternatively the softer rubber can be inserted, with its covering of expanded metal, into the spring eye and followed by the harder rubber sleeve alone and the rigid metal sleeve finally inserted into the combined annulus.

WHAT WE CLAIM IS:—

1. A flexible joint for location within the bore of a housing, said joint comprising a rigid inner member having a substantially cylindrical external surface, an annular member (hereinafter referred to as the annulus) surrounding the inner member, the annulus being formed of rubber or like resilient material, which material adheres directly to the inner member without the inter-position of another member to accommodate torsional loads and, surrounding the annulus, an outer member which confines the annulus to a generally fixed shape, the outer surface of the outer member being irregular to provide spaced axially and circumferentially interconnected contact areas capable of frictionally engaging and conforming to the shape of the bore of the housing by changes in contour of the outer surface of the outer member.

2. A flexible joint as claimed in Claim 1 in which the external surface of the outer member is made irregular by the provision of indentations in the outer member extending in a generally radial direction.

3. A flexible joint as claimed in Claim 1 in which the external surface of the outer member is made irregular by the provision of apertures extending through the outer member in a generally radial direction, into or through which portions of the annulus extend.

4. A flexible joint as claimed in Claim 3 in which the outer member is formed of wire mesh.

5. A flexible joint as claimed in Claim 3 in which the outer member is formed of gauze.

6. A flexible joint as claimed in Claim 3 in which the outer member is formed of expanded metal.

7. A flexible joint as claimed in Claim 3 in which the outer member is formed of woven metal mesh of which the weft and warp extend oblique to the axis of the joint.

8. A flexible joint as claimed in Claim 3 in which the outer member is formed from punched sheet metal.

9. A flexible joint as claimed in Claim 3 in which the outer member is formed of a perforated plastic material.

10. A flexible joint as claimed in any one of the preceding claims in which the annulus of rubber is moulded or bonded into the outer member.

11. A flexible joint as claimed in any one of the preceding claims wherein the annulus of rubber is compressed between the inner and outer members.

12. A flexible joint as claimed in Claim 2 in which the outer member is formed of a plastic material having indentations in at least its external surface to permit the taking up of irregularities in the surface of the outer part.

13. A flexible joint substantially as described herein with reference to any one of Figures 1 to 5 of the accompanying drawings.

14. A mounting comprising a housing, e.g.

a spring eye within which a flexible joint according to any one of the preceding claims is assembled.

KILBURN & STRODE,
Chartered Patent Agents
Agents for the Applicants

Leamington Spa: Printed for Her Majesty's Stationery Office by the Courier Press.—1967
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained.

1078641 COMPLETE SPECIFICATION
1 SHEET This drawing is a reproduction of the Original on a reduced scale

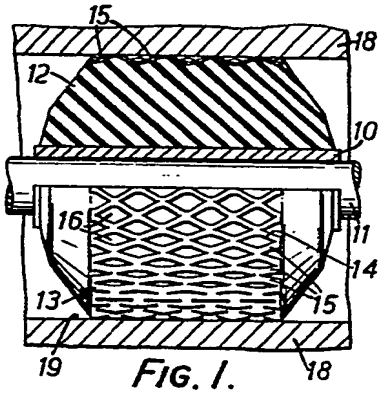

FIG. 1.

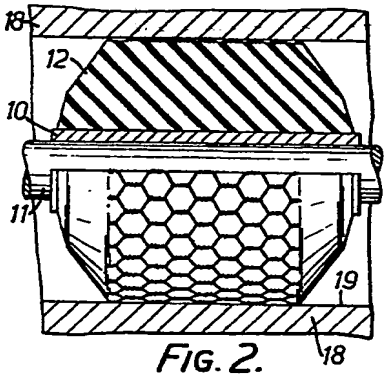

FIG. 2.

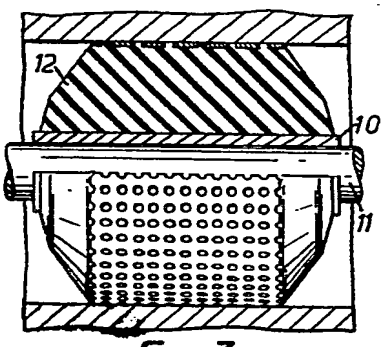

FIG. 3.

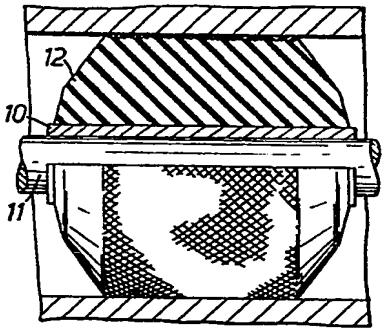

FIG. 4.

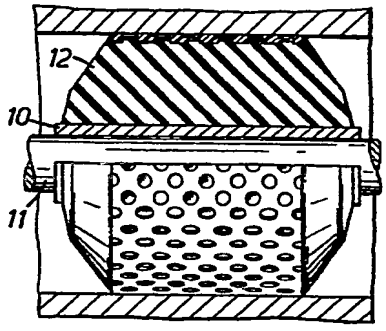

FIG. 5.